

NASA SBIR/STTR Technologies

H2.01-9033 - A Reliable, Efficient Cryogenic Propellant Mixing Pump With No Moving Parts



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Identification and Significance of Innovation

A reliable, efficient, compact cryogenic propellant mixing pump for cryogenic fluid management applications

- Prevent thermal stratification
- Effectively control propellant storage pressure

Innovative operating mechanism to enable reliable operation at cryogenic temperatures

- Eliminate mechanical pistons or impellers
- No mechanical wear
- No vibration
- No pump cavitation problem
- Self-priming

High pumping performance

- Pressure rise higher than 100 mbar
- Flow rate higher than 100 L/min

Estimated TRL at beginning and end of contract: (Begin: 2 End: 3)

Technical Objectives and Work Plan

Technical Objectives

- Efficient operation to minimize parasitic heat generated during pumping process
- High pressure rise and high flow capacity
- Ability to tolerate vapor ingress

Work Plan

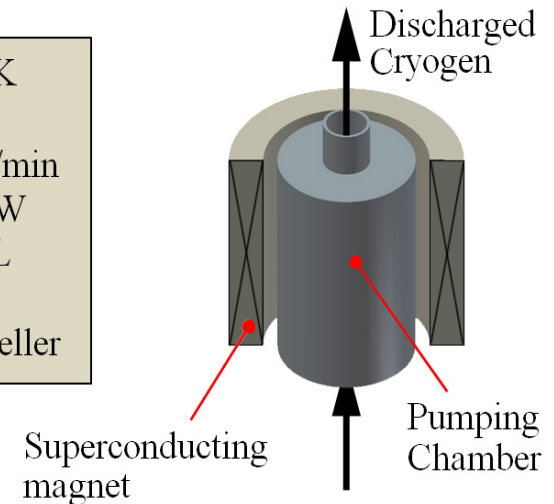
Phase I

- Demonstrate operation and performance of proposed pump
- Develop a pump design and its driving mechanism
- Predict pump performance

Phase II

- Design and fabricate a laboratory-scale cryogenic pump
- Obtain pump performance data under prototypical conditions

Operating T: 20 K
 ΔP : 100 mbar
Flow rate: 100 L/min
Power input: 25 W
Overall size: ~2 L
Highly scalable
No piston or impeller



NASA Applications

- Zero Boil-Off storage of cryogen
- Short-term vented cryogen storage
- General cryogenic fluid management and transfer
- Two-phase thermal management systems

Non-NASA Applications

- Two-phase thermal management systems for military and commercial high power electronics systems
- Thermal management system for superconducting systems

Firm Contacts

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NON-PROPRIETARY DATA